Fig. 1
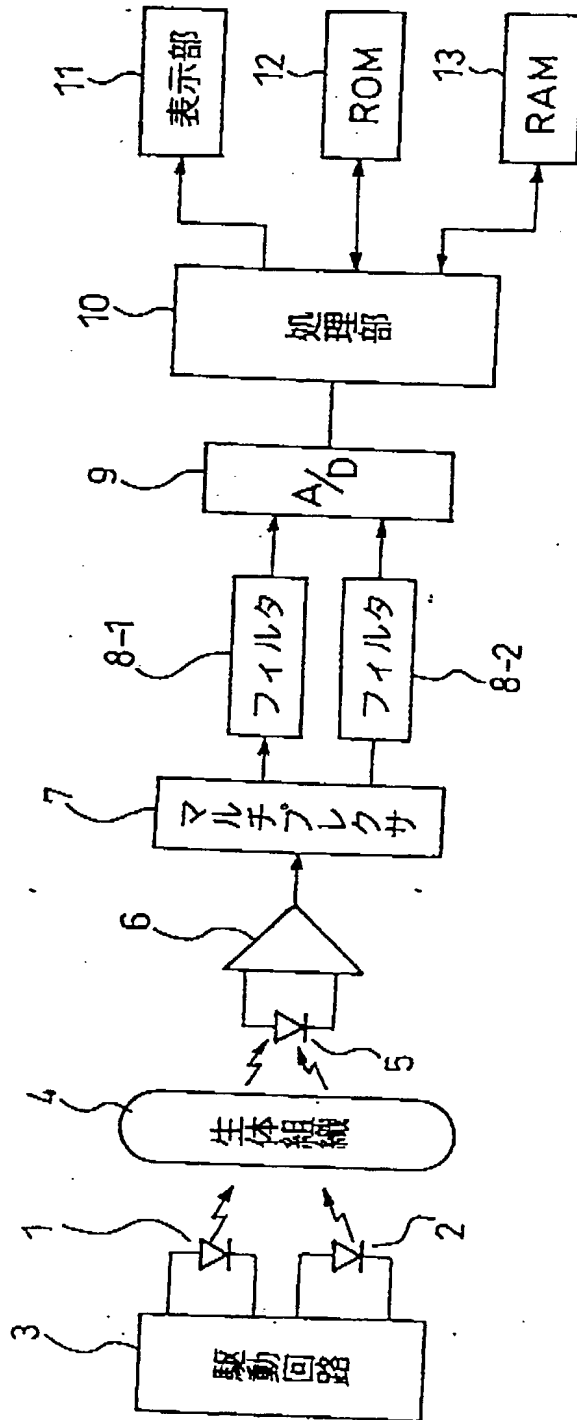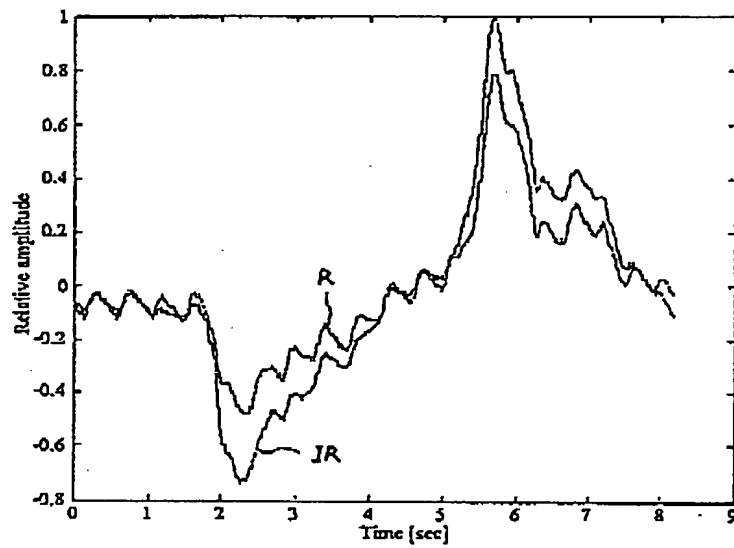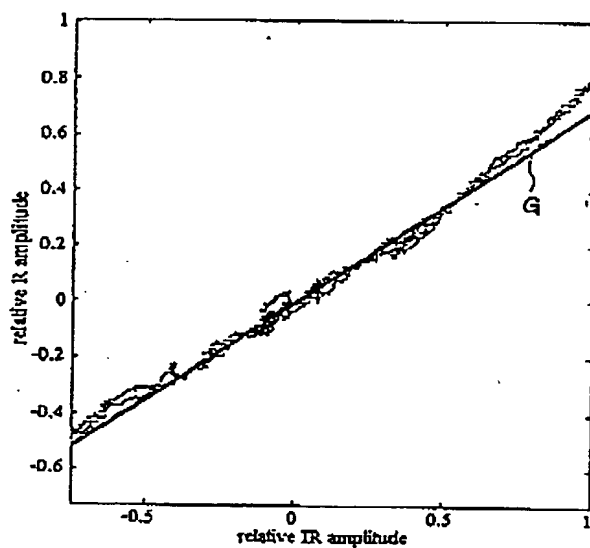

3:    light source driver

4:    living tissue

7:    multiplexer

8-1, 8-2:   filter

9:    A/D converter

10:    processor

11:    display
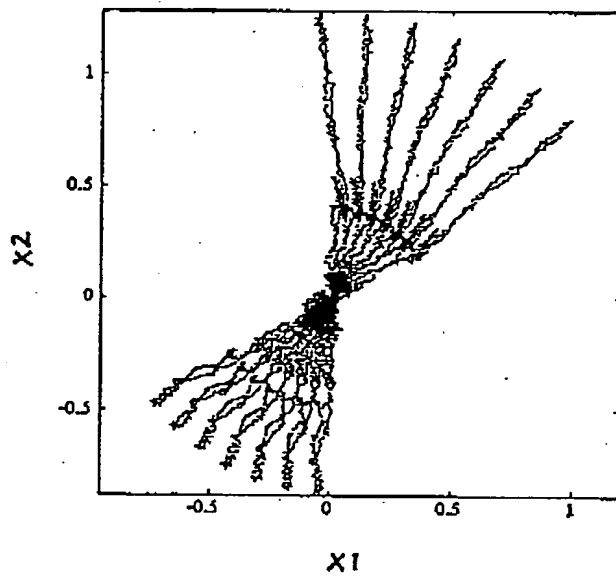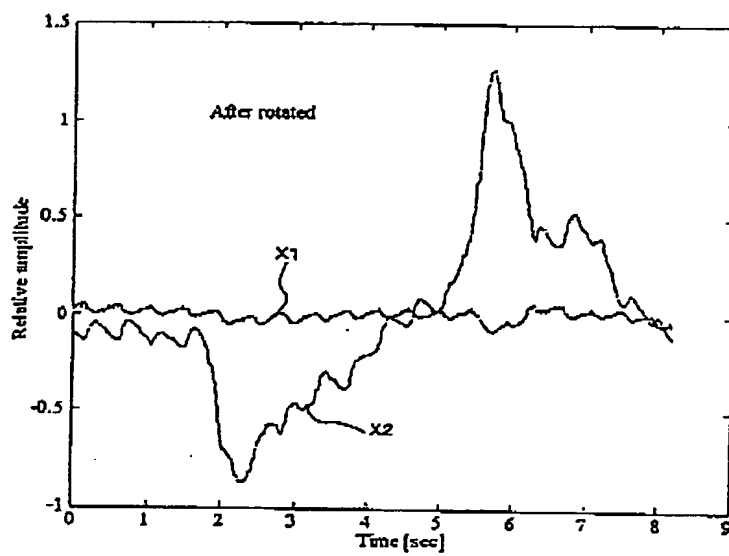
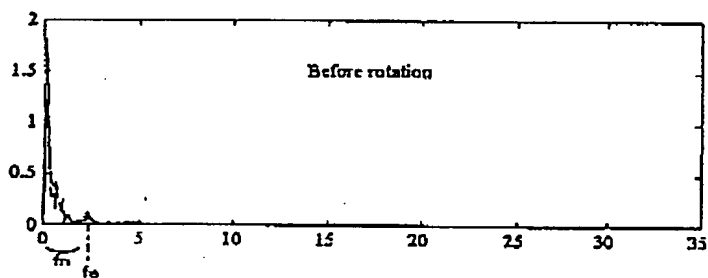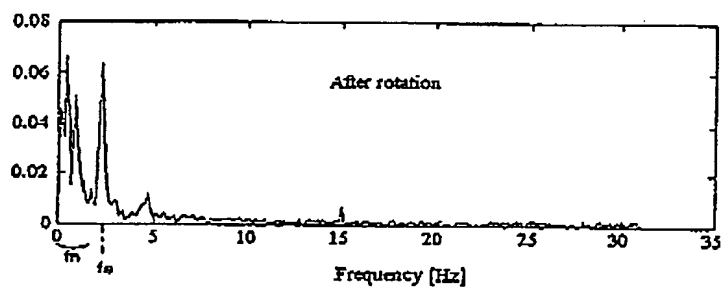Fig. 2

Fig. 3

Fig. 4

Fig. 5

After rotated
X1
X2
Relative amplitude
Time [sec]

Fig. 6A

Fig. 6B

Frequency [Hz]

Fig. 7

S1: start measurement

S2: detect pulse wave signals pertaining to infrared light and red light

S3: obtain ratio of pulsation component to DC component for each pulse wave signal

S4: obtain noise-reduced waveform by processing respective pulse wave data with rotating matrix (rotating angle is predetermined)

S5: obtain fundamental frequency by frequency analysis with respect to noise-reduced waveform for given time period

S6: obtain and display pulse rate

S7: obtain L2 norm values from respective pulse wave signals of given time period and obtain ratio thereof

S8: obtain oxygen saturation from L2 norm ratio

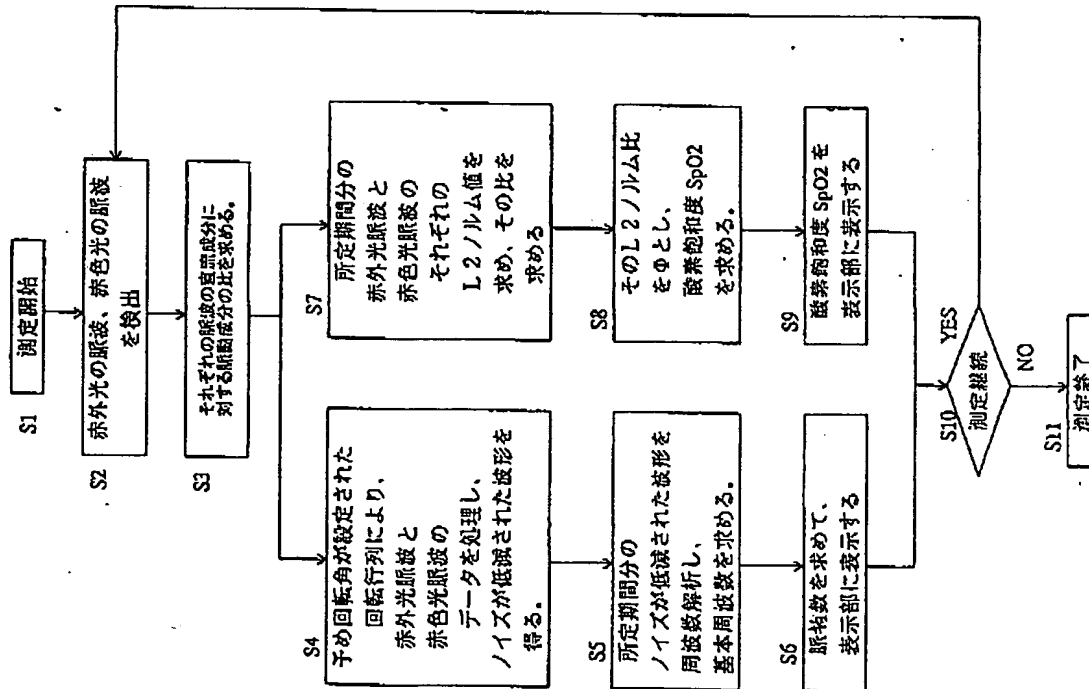S9: display oxygen saturation
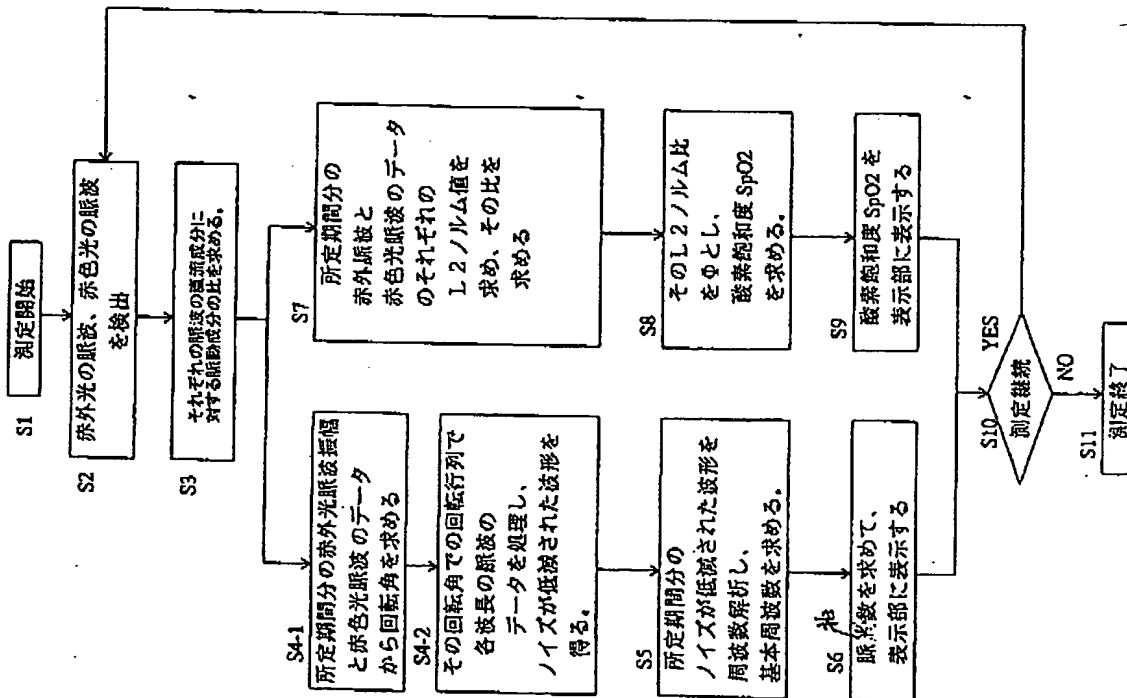
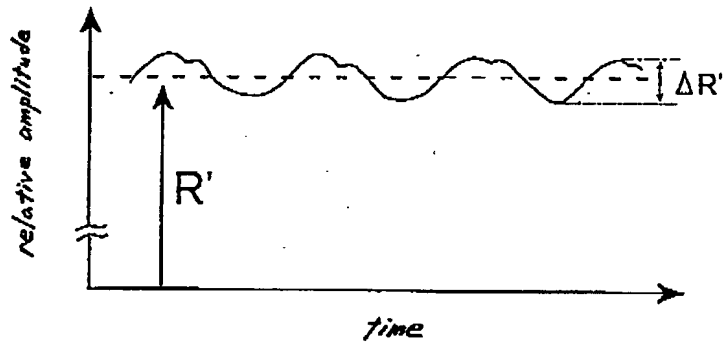S10: measurement is continued?

S11: terminate measurement

Fig. 8

S1: start measurement

S2: detect pulse wave signals pertaining to infrared light and red light

S3: obtain ratio of pulsation component to DC component for each pulse wave

S4-1: obtain rotating angle from respective pulse wave data for given time period

S4-2: obtain noise-reduced waveform by processing respective pulse wave data with rotating matrix corresponding to obtained rotating angle

S5: obtain fundamental frequency by frequency analysis with respect to noise-reduced waveform for given time period

S6: obtain and display pulse rate

S7: obtain L2 norm values from respective pulse wave signals of given time period and obtain ratio thereof

S8: obtain oxygen saturation from L2 norm ratio

S9: display oxygen saturation

S10: measurement is continued?

S11: terminate measurement

S1 測定開始

S2 赤外光の脈波、赤色光の脈波を検出

S3 それぞれの脈波の直流成分に対する脈動成分の比を求める。

S4-1 所定期間分の赤外光脈波振動器と赤色光脈波のデータから回転角を求める

S4-2 その回転角での回転行列でデータを処理し、各波長の脈波のデータを処理し、ノイズが低減された波形を得る。

S5 所定期間分のノイズが低減された波形を周波数解析し、基本周波数を求める。

S6 脈拍数を求めて、表示部に表示する

S7 所定期間分の赤外脈波と赤色光脈波のデータのそれぞれのL2ノルム値を求め、その比を求める

S8 そのL2ノルム比を中とし、酸素飽和度SpO2を求める。

S9 酸素飽和度SpO2を表示部に表示する

S10 測定継続 YES / NO

S11 測定終了

Fig. 9A

R'

ΔR'

relative amplitude

time

Fig. 9B
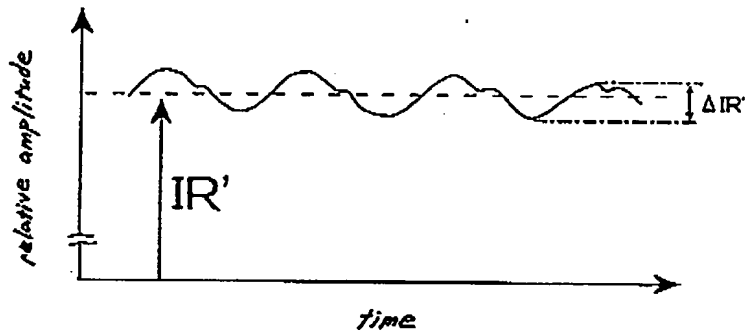
IR'

ΔIR'

relative amplitude

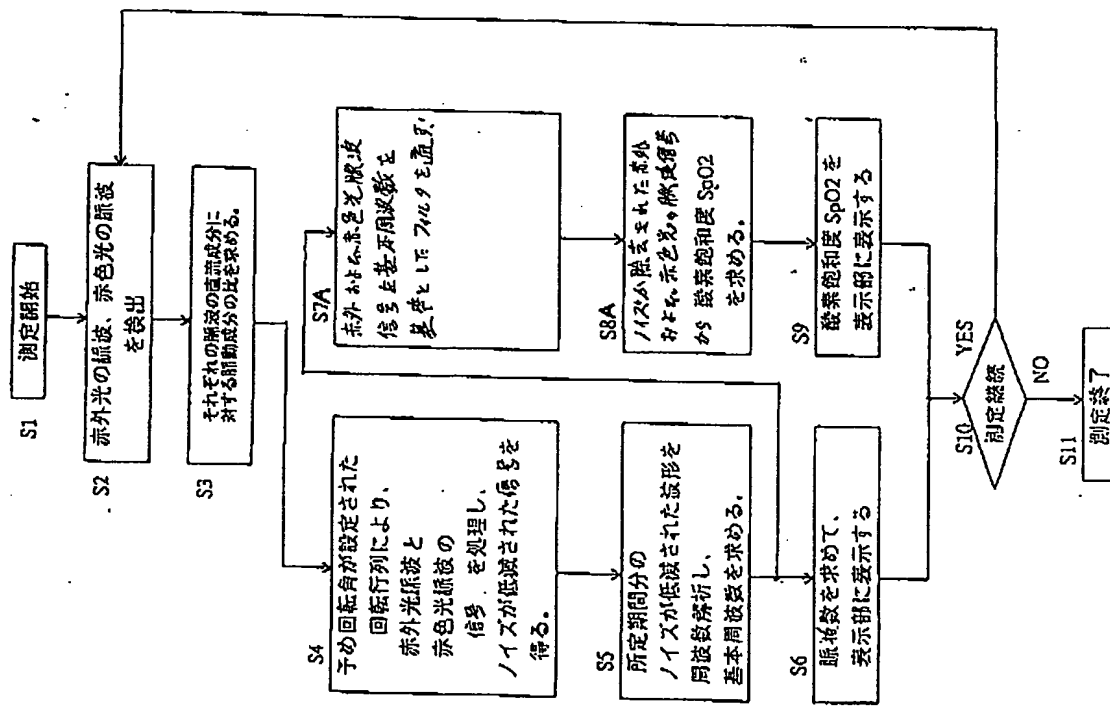time

Fig. 10

S1: start measurement

S2: detect pulse wave signals pertaining to infrared light and red light

S3: obtain ratio of pulsation component to DC component for each pulse wave

S4: obtain noise-reduced waveform by processing respective pulse wave data with rotating matrix (rotating angle is predetermined)

S5: obtain fundamental frequency by frequency analysis with respect to noise-reduced waveform for given time period

S6: obtain and display pulse rate

S7A: pass respective pulse wave signals through filter associated with fundamental frequency to obtain noise-reduced pulse wave signals

S8A: obtain oxygen saturation from ratio of noise-reduced pulse wave signals

S9: display oxygen saturation

S10: measurement is continued?

S11: terminate measurement

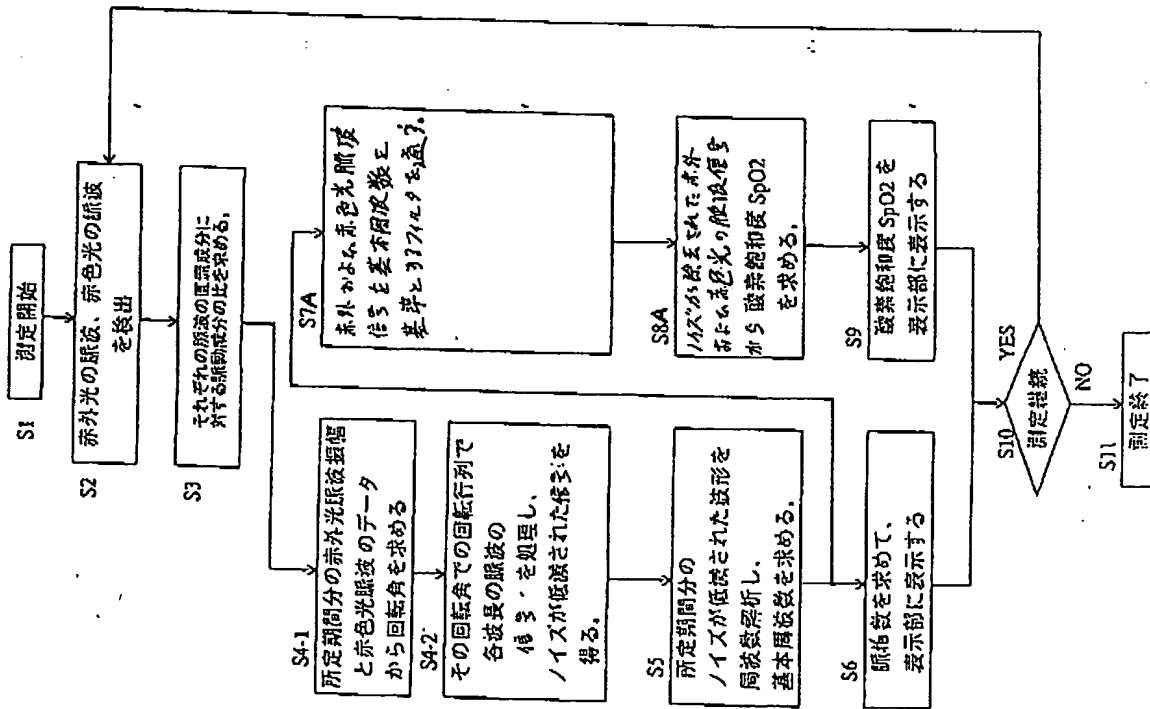## Fig. 11

S1:   start measurement

S2:   detect pulse wave signals pertaining to infrared light and red light

S3:   obtain ratio of pulsation component to DC component for each pulse wave

S4-1: obtain rotating angle from respective pulse wave data for given time period

S4-2: obtain noise-reduced waveform by processing respective pulse wave data with rotating matrix corresponding to obtained rotating angle

S5:   obtain fundamental frequency by frequency analysis with respect to noise-reduced waveform for given time period

S6:   obtain and display pulse rate

S7A: pass respective pulse wave signals through filter associated with fundamental frequency to obtain noise-reduced pulse wave signals

S8A: obtain oxygen saturation from ratio of noise-reduced pulse wave signals

S9:   display oxygen saturation

S10: measurement is continued?

S11: terminate measurement